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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/749,878	12/30/2003	Moon-Keun Lee	51876P521	8909

8791 7590 10/04/2005

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EXAMINER

SMITH, BRADLEY

ART UNIT	PAPER NUMBER
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2891

DATE MAILED: 10/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/749,878

Applicant(s)

LEE ET AL.

Examiner

Bradley K. Smith

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 8-23 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 and 24-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 8,9,11-14,17-20,23 is/are rejected.
- 7) ☒ Claim(s) 10,15,16,21 and 22 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 5/11/05, 9/2/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: search notes.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of species 1 (claims 8-23) in the reply filed on 9/15/05 is acknowledged. (The examiner called Eric Hyman on 9/23/05 to clarify the response to the last restriction requirement, since claims 1-8 had been previously withdrawn. The attorney acknowledged the applicant meant to elected claims 8-23).

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 8, 9 11-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Jin et al. (Hynix Semiconductor Inc 2000KR-0037382). Jin et al. disclose providing a silicon substrate on which predetermined processes are completed; performing a plasma treatment to a surface of the silicon substrate in a gaseous atmosphere including nitrogen', depositing a titanium layer on the silicon substrate by employing a physical vapor deposition (PVD) technique; and causing the silicon substrate to react with the deposited titanium layer through the use of a thermal treatment to form an

epitaxially grown titanium silicide layer (see detailed description) having a phase of C49 (the epitaxial C49 phase would inherently form after the anneal). With regards to claim 9, Jin et al. disclose using a nitrogen plasma process. With regards to claim 11, Jin et al. disclose the PVD technique is an Ion Metal Plasma technique. With regards to claim 12 Jin et al. disclose the formation of titanium nitride. With regards to claims 13 and 14 Jin et al. disclose the furnace anneal (thermal process).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 17 –20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jin et al. (Hynix Semiconductor Inc 2000KR-0037382) in view of Cheng et al (US 2002/0171107). Jin et al. disclose providing a silicon substrate on which predetermined processes are completed; performing a plasma treatment to a surface of the silicon substrate in a gaseous atmosphere including nitrogen, depositing a titanium layer on the silicon substrate by employing a physical vapor deposition (PVD) technique; and causing the silicon substrate to react with the deposited titanium layer through the use of a thermal treatment to form an epitaxially grown titanium silicide layer (see detailed description) having a phase of C49 (the epitaxial C49 phase would inherently form after the anneal). However Jin et al. fails to disclose the removal of the

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excess titanium and the cleaning of the semiconductor wafer before the plasma treatment with HF and NF<sub>3</sub>. Whereas Cheng et al. disclose the removal of the excess titanium and the cleaning of the semiconductor wafer before the plasma treatment. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Jin et al. and Cheng et al. because cleaning the wafer will remove defects and removing the excess/unreacted titanium will remove unnecessary material.

***Allowable Subject Matter***

6. Claims 10, 15, 16, 21, and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach or suggest with respect to the entire claim the plasma treatment is carried out for about 30 seconds to about 60 seconds at a temperature ranging from about 400 degC to about 450 degC and a pressure ranging from about 3 Torr to about 5 Torr along with power ranging from about 400 W to about 500 W.(claims 10 and 21) performing a first RTP at a temperature ranging from about 670 degC to about 850 degC for about 20 seconds to about 30 seconds; and performing a second RTP at a temperature ranging from about 850 degC to about 900 degC for about 20 seconds to about 30 seconds (claims 15, 16 and 22).

***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. "Epitaxial Growth of  $\text{TiSi}_2$  (C49) on (001) Si by Rapid Thermal Annealing" disclose that the an epitaxial layer of C49 forms on the silicon surface (conclusion).

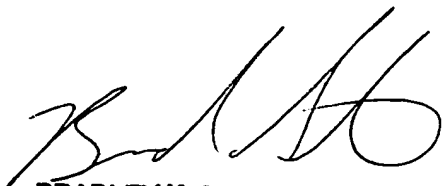
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley K. Smith whose telephone number is (571) 272-1884. The examiner can normally be reached on 10-6 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Baumeister can be reached on (571) 272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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A handwritten signature in black ink, appearing to read 'Bradley K. Smith', with a stylized, cursive script.

**BRADLEY K. SMITH**  
**PRIMARY EXAMINER**